

The remainder of the volume is occupied with reports of scientific investigations carried out in the board's vaccine laboratories by Dr. Blaxall, Mr. Fremlin, and Dr. Green, and a number of excellent plates illustrating the various researches.
R. T. HEWLETT.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—During the first fortnight of last month some four hundred candidates were being examined at Cambridge for entrance scholarships. The majority of the larger colleges are now combined into two groups, the larger of which includes Pembroke, Gonville and Caius, Jesus, St. John's, Christ's, King's, and Emmanuel, whilst the smaller comprises Peterhouse, Clare, Trinity Hall, Trinity, and Sidney Sussex. Queens' examined alone, and a week later than the two large groups. As a result of the examination of these thirteen colleges a sum amounting to a little more than 6000*l.* was awarded in scholarships to 108 successful candidates. This total does not include the sum, which amounted to some hundreds of pounds, given in exhibitions, sizarships, and subsizarships, and in certain extra scholarships offered by some of the colleges after the result of the first selection had been published. It is interesting to note the number of scholars and the value of the scholarships given in the different subjects. Out of a little more than 6000*l.* awarded to 108 candidates, classics gained 2850*l.*, divided amongst 49 scholars, mathematics, with 34 scholars, earned 1945*l.*, and the natural sciences divided 990*l.* amongst 20 successful competitors, whilst candidates in history and oriental and modern languages were successful in only five instances, and these 5 divided amongst them 220*l.*

AMONG the papers down for reading at a conference of the National Federation of Head Teachers' Associations, arranged to be held at Cambridge yesterday and to-day, is one by Sir Lauder Brunton, F.R.S., on "The Proposed National League for Physical Education and Improvement."

Science announces that Mr. E. D. Adams has given 10,000*l.* to Columbia University for the foundation of a research fellowship in physical science. The gift is accompanied by a valuable collection of scientific apparatus to be allotted to the electrical, physical, and psychological laboratories of the university.

THE prospectus for 1904-5 of the Colorado School of Mines shows that much importance is attached in the metallurgical courses to visits arranged for the students to works where typical processes in metallurgy can be seen in operation under commercial conditions. Immediately after taking up the study of metallurgy, trips extending throughout the junior and senior years are begun. These excursions, intended to illustrate the lectures, are taken while the particular topics are under discussion, and tend to aid greatly in an appreciation of approved machinery and practice. By means of outlines with which the student is provided, which he is required to fill out, care is taken that all the important points in connection with each plant visited are studied and reported upon.

THE following recent educational appointments are announced:—Dr. Foster P. Boswell assistant in psychology and Mr. Edwin Lee Norton instructor in philosophy at Wisconsin. Miss Florence Fitch associate professor of philosophy in Oberlin College. Prof. F. S. Luther, who occupies the chair of Trinity College, Hartford, Conn., has been elected president of the college. Dr. J. Stebbins has been appointed assistant professor of astronomy, and Mr. A. H. Wilson instructor in mathematics, at Illinois; Dr. H. B. Evans assistant professor of mathematics at Pennsylvania; Mr. C. P. Weston assistant professor of mechanics, Mr. H. R. Willard instructor in mathematics, and Mr. R. K. Morley tutor in mathematics, at Maine; Mr. W. D. Cairns associate professor of mathematics, and Mr. J. R. Luckey assistant in mathematics and physics, at Oberlin; Mr. E. D. Grant associate professor of mathematics at the Michigan College of Mines; Dr. K. Schmidt professor of mathematics and astronomy at Lake City, Florida.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 17, 1904.—"Theory of Amphoteric Electrolytes." Part ii. By Prof. James Walker F.R.S.

In a previous paper (see NATURE, April 7, 1904, vol. lxi. p. 545) it was shown that it is possible to express the concentrations of the ions present in the aqueous solution of an amphoteric electrolyte in terms of the concentration of the un-ionised substance, the dissociation constants of the substance acting as acid and as base respectively, and the ionisation constant of water. In the present paper the values for the aminobenzoic acids have been recalculated, and a closer concordance obtained between theory and experiment than was apparent in the former calculations. As a knowledge of the concentration of the un-ionised proportion of an amphoteric electrolyte in solution is of fundamental importance in the application of the theory, a table is given of the values of this magnitude with varying constants and total concentration. From this table it appears that when the acidic and basic constants approximate in value, dilution has little effect on the total ionisation of an amphoteric electrolyte, although the proportions of the two positive ions, and consequently the molecular conductivity, may vary greatly.

For a series of amphoteric electrolytes with a constant product $k_a k_b$, where k_a is the acidic and k_b the basic constant, it may be shown that the simultaneous alteration of $1/k_a$, k_b , and v in the same ratio has no effect on the total ionisation. From this and the preceding result it may be deduced that in such a series, beginning with an infinitely small value of k_b the total ionisation falls off as k_a diminishes and k_b increases, the fall being at first rapid, thereafter becoming slower until, through a comparatively long range, it is practically constant at the minimum value, which is actually reached when $k_a = k_b$. At this point the substance is absolutely neutral. As $1/k_a$ still further diminishes, and k_b correspondingly increases, the ionisation begins to increase, very slowly at first, and the substances considered become more and more basic in character. Finally, the ionisation increases rapidly, and we deal at last with a practically simple base for which k_a is infinitely small.

The theory has been applied to cacodylic acid and to asparagine with satisfactory accordance with the experimental results.

December 1, 1904.—"On Chemical Combination and Toxic Action as exemplified in Hæmolytic Sera." By Prof. Robert Muir and Carl H. Browning.

This paper deals with the mode of action of complements—those comparatively labile bodies which are present in the serum of normal animals, and which are the active substances in hæmolysis and bacteriolysis. Towards red corpuscles treated with the suitable immune-body (the anti-substance developed by the injection of such corpuscles into an animal of other species) a complement may be regarded as a toxin, and already many points of similarity in the constitution of toxins and complements have been brought forward. The hæmolytic dose of a particular complement varies greatly in the case of different corpuscles, when each variety is treated with the corresponding immune-body, and the question dealt with in this communication is whether such variations in dosage are due to variations in the combining affinities of complements or to variations in their toxic action. For example, the hæmolytic dose of guinea-pig's complement is ten times greater in the case of its own corpuscles than it is in the case of the ox's corpuscles, and the writers show by quantitative methods that in the former case the whole of this large dose of complement enters into combination with the guinea-pig's corpuscles (through the medium of the immune-body); there is no want of combining affinity of complement, but its toxic action is slight. A similar result was obtained with each of three sera investigated—a relative non-sensitiveness of the corpuscles of an animal to its own complement; in one case there was also a deficiency in the combining power of the complement. All the results go to emphasise the importance of distinguishing these two factors in the action of a complement, which correspond with the two chief atom groups designated by Ehrlich "haptophore," or combining, and

"zymotoxic." As bearing on the general biology of the subject, the following may be quoted:—"No one has yet succeeded in producing an anti-substance or immune-body by injecting an animal with its own corpuscles or cells—such a body as with the aid of complement would produce destruction of these cells. This is manifestly a provision against self-poisoning, and Ehrlich has applied to it the term *autotoxicus horror*. The results which we have brought forward, if they were found to hold generally, would go to show that even if some substance should appear which acted as an immune-body, there is a provision whereby the complement of an animal should produce comparatively little harmful effect."

Chemical Society, December 14, 1904.—Prof. W. A. Tilden, F.R.S., president, in the chair.—The following papers were read:—Hydrolysis of ammonium salts: V. H. **Veley**. It is shown that when aqueous solutions of ammonium salts are heated the evolution of ammonia and the concomitant acidity of the solutions are due not to dissociation, but to hydrolysis.—The viscosity of liquid mixtures, part ii.: A. E. **Dunstan**. The author's conclusions, given in a previous paper (*Chem. Soc. Trans.*, 1904, lxxxv., 817), are confirmed by the present series of viscosity-concentration measurements for a number of binary mixtures containing hydroxy-compounds.—The diazo-reaction in the diphenyl series, part ii., ethoxybenzidine: J. C. **Cain**. The author has examined the action of heat on the solution of the diazonium salt prepared from ethoxybenzidine, and has shown that the diazonium group, adjacent to the ethoxy-group, is normally substituted by hydroxyl, whilst the other remains intact.—The sulphate and the phosphate of the dimercurammonium series: P. C. **Ray**. When dimercurammonium nitrite, $\text{NH}_2\text{Hg}_2\text{NO}_2$, is treated with an oxyacid, the dimercurammonium complex remains intact. In this way, the author has succeeded in preparing the sulphate and the phosphate of the series.—A method for the direct production of certain aminoazo-compounds: R. **Meldola** and L. **Eynon**. The authors have found that most diazotised amines when treated in aqueous solutions with a strong solution of sodium dichromate give crystalline precipitates of diazonium chromates. These chromates are more or less explosive when dry, and it is suggested that some of them might find technical application as high explosives.—The combination of mercaptans with olefinic ketonic compounds: S. **Ruhemann**.—Studies in optical superposition, part i.: T. S. **Patterson** and F. **Taylor**. Menthyl acetate, *l*-menthyl *d*-tartrate, and *l*-menthyl diacetyl-*d*-tartrate have been prepared and their rotations examined between 0° and 100° . It is shown to be possible by analogy to trace the separate effects of the different active groups composing menthyl tartrate and its diacetyl derivative.

Linnean Society, December 15, 1904.—Prof. W. A. Herdman, F.R.S., president, in the chair.—The ecology of woodland plants in the neighbourhood of Huddersfield: Dr. T. W. **Woodhead**. The plant-associations of this portion of west Yorkshire having been dealt with on broad lines by Smith and Moss, the author has endeavoured to carry the study a stage further by paying special attention to a very limited area. A small wood (Birks Wood, near Huddersfield) was examined in great detail, and the main factors determining the distribution of the more important plants of the undergrowth studied, such as soil, shade produced by the dominant tree, moisture, exposure, and wind. The results thus obtained were then tested by an examination of the woodlands in an area of 66 square miles to the south and west of Huddersfield; special attention was also paid to the distribution of these species beyond the limits of the woodlands.—Experimental studies in heredity in rabbits: C. C. **Hurst**. The studies were based on breeding between a Belgian "hare" and an albino Angora; the second generation showed but little outward variation from the Belgian parent, but the third generation displayed great diversity of colour—albino, grey, black, and variegated. These experiments tallied in a very close degree with the numbers expected according to the Mendelian laws.

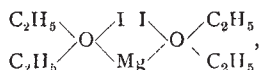
Faraday Society, December 19, 1904.—Mr. J. Swinburne, vice-president, in the chair.—The electric furnace: its origin, transformations, and applications, part ii.: M.

Adolphe **Minet**.—Electrolytic analysis of cobalt and nickel: Dr. F. Mollwo **Perkin** and W. C. **Prebble**. *Cobalt*.—The aim of the experiments was to obtain bright deposits of the metal that should be quantitatively accurate. The most satisfactory results were obtained with a solution containing an alkali phosphate and a little phosphoric acid, the latter to prevent the precipitation of the double sodium cobalt phosphate. *Nickel*.—Similar solutions were tried for nickel deposition. In this case good results were obtained with a borate solution, while a phosphate solution, which gave good figures in the case of cobalt, was not at all satisfactory.—(1) The electrolytic preparation of tin paste; (2) note on the electrolytic recovery of tin: F. **Gelstharp**. The electrolytic process is less costly than other processes in spite of the low current efficiency (50 per cent.), and it can be worked continuously. The process consists in dissolving anodes of tin, roughly cast from commercial ingots, in dilute hydrochloric acid, and depositing the metal in the form of sponge on cathodes of block tin or tinned iron. In the second note an experiment is described that has some bearing on the conditions necessary for electrolytically stripping tin plate.

PARIS.

Academy of Sciences, December 26, 1904.—M. Mascart, in the chair.—On the theorem of areas and conservative systems: Paul **Painlevé**.—Groups of negative bands in the air spectrum with a strong dispersion: H. **Deslandres**. A detailed examination under high dispersion of the ultra-violet band λ 3914. This band is intense round the negative pole in vacuum tubes filled with air or nitrogen and it constitutes nearly exclusively the cathode light of gases; it is found in the aurora borealis and in the radium light.—On the constitution of the sodium salts of certain methenic and methinic acids: A. **Haller** and P. Th. **Muller**. A differential optical method has been employed in this work, comparing the molecular refraction of the sodium salt with its corresponding acid, so far as possible in the same solvent and at equal concentrations. The substances studied included cyanacetic ester, propionyl-cyanacetic ester, malonic and cyanomalonic esters, malonitrile, and cyanocamphor. The results indicate that all the sodium salts examined have a different constitution from that of the generating acid, and hence that the latter should be classed as pseudo-acids.—On some new geological discoveries in the Soudan: A. **de Lapparent**. The fossils found present a fresh proof of the existence of an arm of the sea penetrating into the Soudan.—On the new Giacobini comet: M. **Giacobini**. Observations, the elements and ephemeris of the new comet, discovered on December 17, 1904, at the Observatory of Nice.—The provisional elements of the Giacobini comet (December 17, 1904): G. **Fayet** and E. **Maubant**.—Observations of the Tempel comet (1873, 2) made at the Observatory of Algiers with the bent equatorial of 31.8 cm. aperture: MM. **Rambaud** and **Sy**.—On the stability of aërostats fitted with steering apparatus: G. A. **Crocco**.—On the fragility of certain steels: A. **Perot** and Henri Michel **Levy**. A study of the effect of shock on notched test-pieces, a photographic method of recording the results being adopted.—On the cathode rays and the laws of electromagnetism: P. **Villard**. Diagrams are given showing the comparison of the theoretical curves with those actually obtained, and it was found that none of the experimental results present anomalies requiring the assumption of a magnetic friction.—On the thermoelectricity of the aluminium alloys: Hector **Pécheux**. Alloys of aluminium with tin, lead, bismuth, magnesium, antimony, and zinc were studied at 100° , 180° , and 380° C.—On the theory of magnetism: P. **Langevin**. An application of the hypothesis of electrons to the explanation of the phenomena of para- and dia-magnetism.—On a phenomenon of retinal adaptation relating to visual perception of faintly illuminated colours: A. **Polack**.—On the reduction by amorphous boron of the oxides of manganese, and on the preparation of a new boride of manganese: Binet **du Jassonneix**. The composition of the new boride studied is represented by the formula MnB . It fits into the series of well defined and crystallised borides FeB , NiB , and CoB prepared by M. Moissan by means of the electric furnace.—On quadri-

valent oxygen: E. E. **Blaise**. Ethyl ether and magnesium iodide form a well defined, crystalline compound from which the ether is only driven off when heated to temperatures approaching 190° C. Its probable constitution is given as



in which the oxygen must be tetravalent. If this substance is treated with an ether containing an alkyl group of higher molecular weight, as amyl ether, the latter replaces the ethyl ether, and a vigorous reaction ensues.—On the reduction of the anhydrides of the dibasic acids: G. **Blanc**. The anhydrides of pyrotartaric, $\alpha\alpha$ -dimethylsuccinic, $\alpha\alpha$ -dimethylglutaric, $\beta\beta$ -dimethylglutaric, and camphoric acids, when reduced with sodium and absolute alcohol, give good yields of the corresponding lactones.—A general method for the synthesis of aldehydes with the aid of substituted glycidic acids: Georges **Darzens**. A mixture of monochloroacetic ester with any ketone is treated with sodium ethylate in powder. The acid formed by this condensation is unstable, and splits up easily into carbon dioxide and an aldehyde of the type $\text{RR}'\text{CH}=\text{CHO}$, where the original ketone was $\text{RR}'\text{:CO}$. The reaction has been applied to a considerable number of ketones and found to be quite general.—On the diastatic coagulation of starch: A. **Fernbach** and J. **Wolff**. It is shown that the diastatic coagulation of starch is only possible if it is in a state of liquefaction, this being produced either by a liquefying diastase or artificially.—On the combustion of sulphur in the calorimetric bomb: H. **Giran**. The heat of combustion of sulphur has been determined in the Berthelot bomb at pressures varying between 2.5 and 45 atmospheres, with the unexpected result that the heat of formation of sulphur dioxide increases with the pressure. This result is regarded as being possibly due to the formation of the persulphuric anhydride of Berthelot.—On the electrical conductivity of colloidal solutions: G. **Malfitano**. In order to eliminate the effect possibly produced by the presence of minute traces of electrolytes in solution, the conductivity of the colloidal solutions was taken both before and after filtration through a thin film of collodion, it having been shown by preliminary experiments that solutions of pure electrolytes undergo no appreciable change after such filtration. It was found that the conductivity due to the fine particles in suspension was practically nil.—On the comparative production of alcohol and carbonic acid during fermentation: M. **Lindet** and P. **Marsais**. The ratio of alcohol to carbonic acid has been followed throughout the whole course of a fermentation, the effect of varying temperature being also studied.—Study of calcium carbide used as an explosive in mining work: Marcel P. S. **Guedras**. The cartridge used consisted of a charge of calcium carbide separated by an insulating membrane from water. The membrane is broken by a cap controlled electrically, and after five minutes the explosive mixture is fired also by electrical means. The explosion takes place in a manner well adapted for mining work.—On the histology of the myocardium in the primitive molluscs: P. **Vigier** and Fr. **Vies**.—Intranuclear fat in the suprarenal capsules of mammals: P. **Mulon**.—On the migration of glucosides in plants: W. **Russell**.—On the destruction of the winter egg of Phylloxera by lysol: G. **Cantin**. An account of experiments demonstrating the practical efficacy of a 1 per cent. solution of lysol against the disease.—On the mineral species of arable earth: A. **Delage** and H. **Lagatu**.—The geology of Sahel, Algeria: General **de Lamothé**.—The culture of the parasite of dysentery of warm countries: A. **Lesage**.—On infectious anæmia of the horse: MM. **Carre** and **Vallée**.

DIARY OF SOCIETIES

THURSDAY, JANUARY 5

RONTGEN SOCIETY, at 8.15.—Description of an Automatic Vacuum Pump: C. E. S. Phillips. (The apparatus will be shown at work.)—Exhibition of a Method by which Strongly Adherent Films of Aluminium may be applied to Glass.—A Note on the Coloration of Glass by Radium Radiation.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Thames Barge: James Casey.

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FRIDAY, JANUARY 6.

INCORPORATED SOCIETY OF MEDICAL OFFICERS OF HEALTH, at 7.30.—The Report of the Inter-Departmental Committee on Physical Degeneration: Sir Lauder Brunton, F.R.S.

GEOLOGISTS' ASSOCIATION, at 8.—The Third Issue of the British Association Geological Photographs: Dr. C. G. Cullis.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—National Antarctic Expedition: Capt. R. F. Scott. (Lecture to Young People.)

MONDAY, JANUARY 9.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Some Chemical Aspects of the St. Louis Exhibition: Walter F. Reid.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Mr. Reginald Enock's Journeys in Peru: the President.

TUESDAY, JANUARY 10.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Recent Visit to the United States and Canada: Sir William Henry White, K.C.B. (The Address will be repeated on the following day at 3.30 p.m.)

WEDNESDAY, JANUARY 11.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Brandy: Otto Hehner.

THURSDAY, JANUARY 12.

MATHEMATICAL SOCIETY, at 5.30.—Generational Relations for the Abstract Group simply Isomorphic with the Abstract Group $\text{LF}[2, \mu]$: Dr. W. Burnsey.—On a Class of Expansions in Oscillating Functions: Prof. A. C. Dixon.—Isogonal Transformation and the Diameter Transformation: H. L. Trachtenberg.—A Generalisation of the Legendre Polynomial: H. Bateman.—Current Flow in Rectangular Conductors: H. Fletcher Moulton.—Basic Generalisations of some well known Analytic Functions: Rev. F. H. Jackson.

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